INERTIAL CONFINEMENT FUSION
Lawrence Livermore National Laboratory

Monthly Highlights

August 1999

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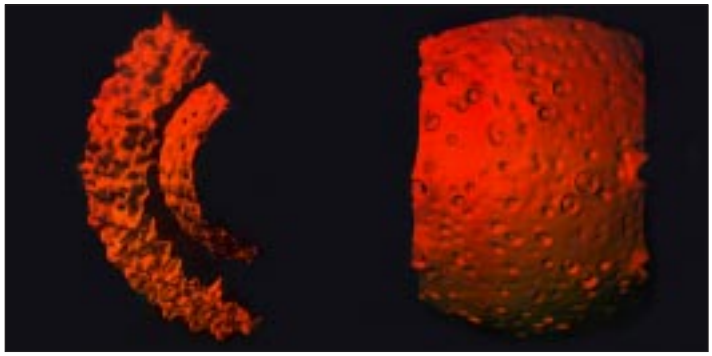
Switchyard Two Support Structure Up. The support structure for the National Ignition Facility's (NIF's) Switchyard Two is 30% assembled (see photo below). This structure, which will allow for precision installation and welding, is the skeleton for the beam tubes, mirror mounts, and other components that will direct the 192 laser beams from the laser bay into the target chamber. It is 92 feet high, and its 1200 tons of steel fill a million cubic feet of space. Agra Coast is putting up the structure, with Rigging International doing the installation.

The NIF Switchyard Two support structure, 30% complete.

NIF Transporter Successfully Tested. The first acceptance test procedure (ATP) was successfully completed for the first transporter of the National Ignition Facility (NIF) Laser Bay Transport System (LBTS) by the vendor in Charlotte, North Carolina. The transporter is an automated, laser-guided vehicle that will be used to move and install the majority of the line replaceable units (LRUs) that make up the NIF laser system. The transporter is scheduled to be shipped to Lawrence Livermore National Laboratory in the second week of August, after which a second ATP will be performed. Integrated tests will then demonstrate the transport, installation, and removal of an LRU into a structure simulating the enclosures in the laser bay.

The laser-guided vehicle that will install NIF laser system components.

3D NIF Capsule Simulations. A large, solid-angle 3D HYDRA simulation has modeled a 72° sector of a National Ignition Facility ignition capsule to study hydrodynamic instability growth from surface roughness. The simulation has resolved simultaneously the full range of modes most dangerous to capsule ignition. This problem was generated in parallel on a mesh of over 16,486,000 zones and run on a full sector of the Accelerated Strategic Computing Initiative SKY platform using 1680 processors. The figure below shows (a) two surfaces of constant density prior to ignition. The outer surface shows nonlinear perturbations in the outer ablator; the inner surface separates the hot spot and the dense fuel. Part (b) shows a contour of the rebounding shock at ignition time. The calculated yield of 15.4 MJ was close to the 1D yield of 17.1 MJ.



(a) Two isodensity surfaces prior to ignition. (b) Contour of the rebounding shock at ignition time.

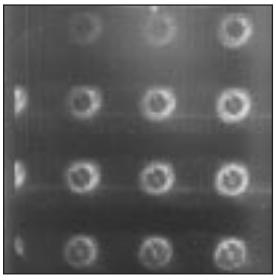


Image captured by 4k × 4k CCD on a double-shell implosion experiment.

CCD Imaging System Successful on OMEGA Laser. The use of a charge-coupled-device (CCD) camera in inertial confinement fusion experiments enables quicker turnaround on data and better signal-to-noise performance than film, while offering similar spatial resolution. In August, a high-resolution CCD was successfully fielded on the Lawrence Livermore National Laboratory (LLNL) experiments at the OMEGA Laser Facility in Rochester, New York. The CCD, which collected data from the primary experimental diagnostics, has a 4000 × 4000 pixel array. Each pixel is 9 μm square. The camera was jointly developed by LLNL's Y and A Divisions, the University of Rochester's Laboratory for Laser Energetics, and Bechtel Nevada.

For comments about content of the *Monthly Highlights*, contact Bob Kauffman (925) 422-0419.
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